9.0 ENVIRONMENT & CONSERVATION

9.1 GEOLOGY, SOILS AND TOPOGRAPHY

The Merrimack and Concord Rivers are the major features, which define the landscape of Lowell. The Merrimack River flows easterly through the northern portion of Lowell and drops approximately 60 feet in its eight-mile course through the city. The river drops 30 feet over the three-mile stretch of Pawtucket Falls. The Concord River flows northerly through Billerica and enters the Merrimack near the Bridge Street Bridge northeast of Lowell Center. The Concord River's gradient drops very little over most of its length from Concord to Billerica and the floodplain tends to be broad. However, once in Lowell, the Concord River drops markedly as is evidenced by the three sets of falls along the river and the relatively narrow floodplain.

9.2 LANDSCAPE CHARACTER

The landscape of Lowell is characterized as an urban setting with several geological features that lend to its attractiveness. While much of the city is highly developed, Lowell does offer many attractive vantage points that are appealing to the eye. The many hills of Lowell allow for a varied view of the city and contrast nicely with the flat relief around the two rivers. The two jewels of the city, the Merrimack and Concord Rivers, gave the city it's founding and led to the birth of the Industrial Revolution. These two rivers served as the backbone for Lowell and the region's economy. Today, they continue to do so but also provide the city with a valuable recreational resource.

9.3 SURFACE WATER

The Merrimack River is the major water body found in Lowell. This river is formed by the confluence of the Pemigewasset and Winnipesaukee Rivers in Franklin, New Hampshire. The river flows southward through New Hampshire to Tyngsborough, Massachusetts then turns northeastward when it reaches Lowell. The river empties into the Atlantic Ocean at Newburyport after flowing through Lowell, Lawrence and Haverhill, three major cities, which historically relied on the river for power and transportation.

The river falls more than 90 feet during its 116-mile flow through Massachusetts. The river drains a land area of 5,010 square miles, 1,210 square miles of this basin are located in Massachusetts. The Merrimack River in Lowell has two access points. The boat ramp at the Bellegarde Boathouse is a private ramp used by the sailing program and the U-Mass Lowell crew team. The other boat ramp adjacent to the Vandenberg Esplanade is open to the public. During the summer numerous boats access the river through this ramp for the purpose of fishing, water-skiing, tubing, or just taking a leisurely ride up the river. A third boat ramp is in the planning stages further up the river just past the Rourke Bridge. The boat ramp is being built by the Public Access Board and is hoped to be opened within the next five years.

The Concord River originates at the confluence of the Sudbury and Assabet Rivers, and flows approximately 16 mile from Concord through Carlisle, Bedford and Billerica before it enters the Merrimack River at Lowell. The river drops 12 feet in the first 15 miles, then falls 50 feet in the final mile through Lowell. The drainage area for the Concord River basin is 62 square miles. The Concord River is the site of some the best white water rafting in the state. Every spring the Lowell Parks and Conservation Trust run white water rafting trips down the Concord River. The season is usually sold out before it even starts. The Public Access Board is building a canoe ramp to provide access to the Concord River at 5 Billerica Street. Local residents have used the site for many years but now will be more accessible to everyone.

The second major tributary to the Merrimack River in Lowell is the Beaver Brook. The brook originates in New Hampshire and meanders southward through Dracut before flowing into the Merrimack River just east of the Pawtucket Falls. Additional tributaries of importance are located in the western part of Lowell. Black Brook begins in a wetland area of North Chelmsford. The brook flows northward, passing through the Middlesex Village area of Lowell before entering the Merrimack River. Claypit Brook originates from a vast wetland in the Lowell/Dracut State Forest in Dracut and initially flows southward. After turning eastward, the brook expands into a small pond before continuing as an outlet stream, which flows into the Merrimack River west of the Pawtucket Dam. Scarlet Brook is a small tributary that originates in Tyngsborough and flows southward to compromise a portion of the Tyngsborough/Lowell border before entering the river. Flagg Meadow Brook, which originates in the Lowell/Dracut/Tyngsborough State Forest, is also a small tributary of the Merrimack River.

River Meadow Brook is the main tributary to the Concord River in Lowell. It begins in a vast wetland region located south of Chelmsford Center and receives a large amount of water form a wetland body, Hales Brook, located east of Route 3 and north of Route 129. It flows into the Concord River near Rogers Street.

Besides the two rivers and several brooks, Lowell is also interlaced with canals that have been in existence since the Industrial Revolution. All of the canals: Eastern Canal, Pawtucket Canal, Northern Canal, Western Canal and the Hamilton Canal are fed by the Merrimack River. The Pawtucket Canal was originally constructed as a transportation route around the Pawtucket Dam. The other canals were later constructed as branches of the Pawtucket Canal to feed additional mill complexes that wanted to use the power of the Canal. This power was generated through the controlled release of water through a series of dams along the canals. Today, Lowell's canals have the capacity to generate 22 megawatts of hydroelectricity.

9.4 Flood Hazard Areas

Flooding often occurs in the Lowell area during the spring because of the snowmelt and spring rain showers. Due to over development, much of the important flood storage area have since been filled and developed. These wetland bodies provide valuable water storage areas for impervious surface runoff. When these stream channels can no longer accommodate increased discharge, water is carried on the flat valley floors or "floodplain" adjacent to rivers, streams and other surface water bodies.

Urbanism in a watershed changes the watershed's response to precipitation. The most noticeable effect is the significantly higher rate of runoff resulting from the increase in construction and parking lots. Whereas natural lands can readily absorb water and transmit it to the water table, impervious surface directs the flow of water and channels it to receiving sites. However, the rate of flow contributes to erosion and the water collects hazardous contaminants. The need to better accommodate automobiles has led to greater reduction in these valuable water storage areas.

Flooding in Lowell is a problem in some areas next to the Merrimack River. This is especially true along the northern bank near the Rourke Bridge. The Concord River also suffers from severe flooding. This past year saw many days above the flood levels especially in sections of Billerica and South Lowell. Many areas along Black Brook, near its confluence with the Merrimack River, have experienced flooding and erosion problems on an annual basis. Flooding along Marshall Brook has also been a problem in past years.

Efforts should be made to protect the remaining parcels of wetlands and prevent further encroachment. Eliminating these flood storage areas or reducing their benefits by restricting the waters movement can lead to further damage and costly improvements to property owners that result from severe flooding

9.5 WETLANDS

Wetlands provide numerous benefits to the community. These wetlands, which compromise a number of wet environments; marches, wet meadows, ponds, bogs, wooded swamps and other types of water dominated areas; provide many ecological resources. They help to maintain water supplies, purify polluted waters, check the destructive power of flood and storm water, nature wildlife and provide numerous recreational opportunities.

Most wetlands found in our urbanized area provide significant benefits in terms of preventing or reducing pollution in a variety of ways. Many of these ways are related to the great absorptive capacity of wetlands. Water can be stored or retained in wetland basins and released slowly into the groundwater. The vegetation in wetlands frequently acts to filter and trap sediments and heavy metals. By trapping these nutrients and minerals, wetlands can purify water and provide healthier environments for fish and plant life. The wetland plants that thrive in wet environments further enhance the pollution attenuation capabilities of wetlands by reducing biological oxygen demand levels, and lowering nitrate and phosphate levels.

A number of factors influence to what degree wetlands function in pollution prevention or reduction. These factors include wetland type, vegetative density, size, and gradient. The previously mentioned storage capacity of wetlands is important for their role in flood control and storm damage prevention. Wetlands can reduce the force and speed of floodwaters, which could cause property damage. In this way, wetlands provide a secondary function by reducing the floodwaters intensity that then reduces erosion. This factor is particularly important in highly urbanized areas such as Lowell where impervious surface intensifies water runoff.

Not only do wetlands provide important benefits for the urbanized environment, they are also necessary breeding and hunting grounds for plant and animal life. Many bird and mammals rely almost solely on wetlands and adjacent vegetative habitats for food, shelter, and reproductive purposes. The actual value as a wildlife habitat depends on the wetland vegetation composition and structure, size and hydrologic relationship. In addition, these habitats provide important recreational opportunities for hunters, fishers, bird watchers and boaters as well as hikers, photographers and environmental educators. Without these important resources, many of our recreational opportunities would quickly disappear if further protection were not pursued.

In Lowell, the wetlands are generally shrub swamps or areas forested with hard wood species. The larger wetland areas of approximately 10 to 25 acres are present in the Lowell/Dracut/Tyngsborough State Forest; along the old Middlesex Canal, Black Brook and portions of the Merrimack and Concord Rivers' floodplain. Other minor wetland locations can be found around the Cross Point Towers parking lots, near Wood Street and Westford Street, several locations along I-495 and near the Cawley Stadium (Route 38). There are several other wetland locations dispersed throughout the city.

Efforts should be maintained at protecting these valuable resources especially along the Concord and Merrimack Rivers to preserve the protective ability of wetlands.

9.6 WATERSHEDS

The City of Lowell is in the Merrimack River Watershed; it is also part of the Concord River Watershed. Some of the smaller watersheds would be around the many brooks in Lowell including Clay Pit Brook, Beaver Brook, Black Brook, and Humphreys Brook. The City works with the Merrimack River Watershed Council to protect the river and brooks. The MRWC does stream and river monitoring and cleanups. The City of Lowell also participates in river cleanups with the Lowell Parks and Conservation Trust. The City of Lowell has a Local Wetland Ordinance, in addition to the Wetlands Protection Act, to protect the wetlands of the area.

9.7 WILDLIFE INVENTORY

Despite Lowell's limited amount of open space, the landscape, particularly along the Concord and Merrimack Rivers, provide a varied wildlife population. Belted kingfishers, blackcrowned night herons, great blue heron, and green herons are common bird species sighted during the summer months. A rookery of black crowned herons was, until recently, located on the Great Bunt of the Merrimack River, a reach at the foot of the Pawtucket Falls where the river makes a wide bend and is joined by beaver Brook. Construction of a sewer interceptor in the area and vandalism of the birds' nesting trees have caused the herons to leave the site. The Bald Eagle has also been sighted in the city, especially during the fall migration period. As Bald Eagles are abundant in the river's estuary, nesting sites should be built along the Merrimack River. Discarded utility poles provide excellent nesting platforms for birds of prey and provide a way to recycle a necessary infrastructure component.

The State Forest contains a diverse habitat that supports squirrels, cottontail rabbits, red fox, various songbirds and fishers that have traditionally been absent but are now returning to the woodland areas of Lowell. Tributaries to Merrimack River have been home to beaver for a number of years as well as several types of waterfowl. The importance of wildlife habitat provided by wetlands has recently become a greater issue for determining wetland value.

9.8 WILDLIFE CORRIDORS

A critical element to habitat survival is the vegetative corridor. Strips of undeveloped land provide essential links for animals and birds to move from one feeding spot to another. Uninterrupted open space allows wildlife to move about and reach other necessary habitats. Once development cuts off this link, animals ultimately face extinction as their habitat dwindles. Maintaining and protecting the vegetative corridor along the Merrimack River can provide wildlife with access to the broader undeveloped tracts located outside the region. The Concord River, with its thick vegetation on both banks of the river is another wildlife corridor used by birds and animals that should be maintained and protected. Protected riverbanks can help birds and animals move in search of food and shelter. These corridors can also provide excellent spots for Lowell residents to view nature in a highly urbanized setting. A completed salmon restoration project by the State has provided a fish ladder at the Pawtucket Dam on the Merrimack River and a fish elevation at the hydroelectric station. This lift and ladder system allows fish to continue their journey up river to spawning grounds in New Hampshire.

9.9 SCENIC LANDSCAPES

The City's most distinctive features are the Merrimack and the Concord Rivers. The wide Merrimack River contributes to a dramatic view and gives the city a general feeling of openness. The Merrimack River is classified as a Massachusetts Scenic River. The Pawtucket Falls, where the Merrimack plunges over the dam, is also a location of special interest. The more intimate Concord River, though heavily developed over much of its length in Lowell, provides many

locations of natural beauty and historic interest. Recent efforts by the Commonwealth to have portion of the Concord River designated as a Wild and Scenic River clearly demonstrates the valuable resources and benefit of protecting this river. The Massachusetts River's Protection Act limits the distance in which development can approach a river to 200 feet unless a special permit is received.

Other scenic areas include the annual foliage viewed from the higher elevations in the city and the two large marshes that compromise approximately 30 acres located in the Lowell/Dracut State Forest. The Lowell Cemetery, designed after Mt. Auburn Cemetery in Watertown, is known for its distinctive plantings and tombstones.

9.10 Hazardous Waste Sites

It is challenging in Lowell to create new open space due to the fact that many of the vacant lots in Lowell are Brownfield sites, which means that there is real or perceived contamination. Currently in Lowell there are 36 sites that are proceeding with an active cleanup of hazardous waste. There are 102 sites in the city that have a permanent solution in place without any activity use limitations. There are an additional 15 that have a permanent solution but do have activity use limitations. There are also several known hazardous waste generator storage and/or disposal facilities along the Merrimack River permitted under the Resource Conservation and Recovery Act (RCRA) program administered by the EPA. These are sources of potential contamination of the Merrimack River, however, unlike non-permitted facilities, they operate under established performance standards and are monitored by the EPA. The Massachusetts Department of Environmental Protection (DEP) has files listing all known RCRA site in the city.

Most of the toxic release sites in the city resulted from leaking underground storage tanks. Two sites are being remediated at this time. The remainder will be cleaned over time, as the process is lengthy and costly. The largest known site in Lowell is the Silresim Chemical Corporation site off Tanner Street.

The Silresim Chemical Corporation facility is currently on the national priority list for Superfund sites. The Superfund program is administered by the Federal government and is responsible for the removal and remediation activities at sites contaminated by improper waste disposal. With Superfund sites, the Federal Government will charge owners, lessors, and companies disposing of chemicals and shippers to collect money to pay for cleaning costs. The Silresim site will cost more than $40 million to clean, work began in 1994 and many companies have been named the suit to recover clean up costs. So far, the EPA has identified 223 parties as having been responsible for the hazardous wastes disposed at the facility. All will be required to pay a certain amount for the clean up.

9.11 Landfills

The Lowell Dump, which has recently been closed and capped, was Lowell's primary solid waste disposal area. The dump now stands at 200 feet high and occupies 48 acres. Through a directive by DEP, the landfill has been properly capped and is being monitored to prevent harmful pollution to the groundwater from leachate and air pollution caused from methane. Because of the proximity of the site to Beaver Brook, testing is being done to ensure that leachate from the dump is not finding its way into the brook. The dump was capped with 18 inches of clay because of its relative impermeability, and a top layer of soil and grass. Ventilation systems were installed to trap and release the methane gases generated by decomposing trash. These gases are harmful and can explode under certain conditions.

9.12 Chronic Flooding

Flooding is a problem along the Concord River during heavy periods of rain. Flooding is also a problem along the northern banks of the Merrimack River near the water treatment plant. Areas of chronic flooding in the city include land around the Black Brook and the Trull brook tributary between Phoenix Avenue and Clark Road. There are several other areas around the city subject to chronic flooding. Many are located in the 100-year flood plain along major waterways of the city including the Concord River, Marginal Brook, River Meadow Brook, Beaver Brook, and Clay Pit Brook.

These wet areas provide many problems for home and business owners in the immediate vicinity through costly property damage. The city has solved some of the flooding problems and will continue to work with the other agencies to address the other areas. Fortunately, many of these areas are in the possession of the conservation commission and therefore protected from further development. The conservation commission reviews all plans for building within a flood plain and uses criteria set up in the Massachusetts Wetlands Protection Act to decide if building will be allowed.

9.13 Ground and Surface Water Pollution

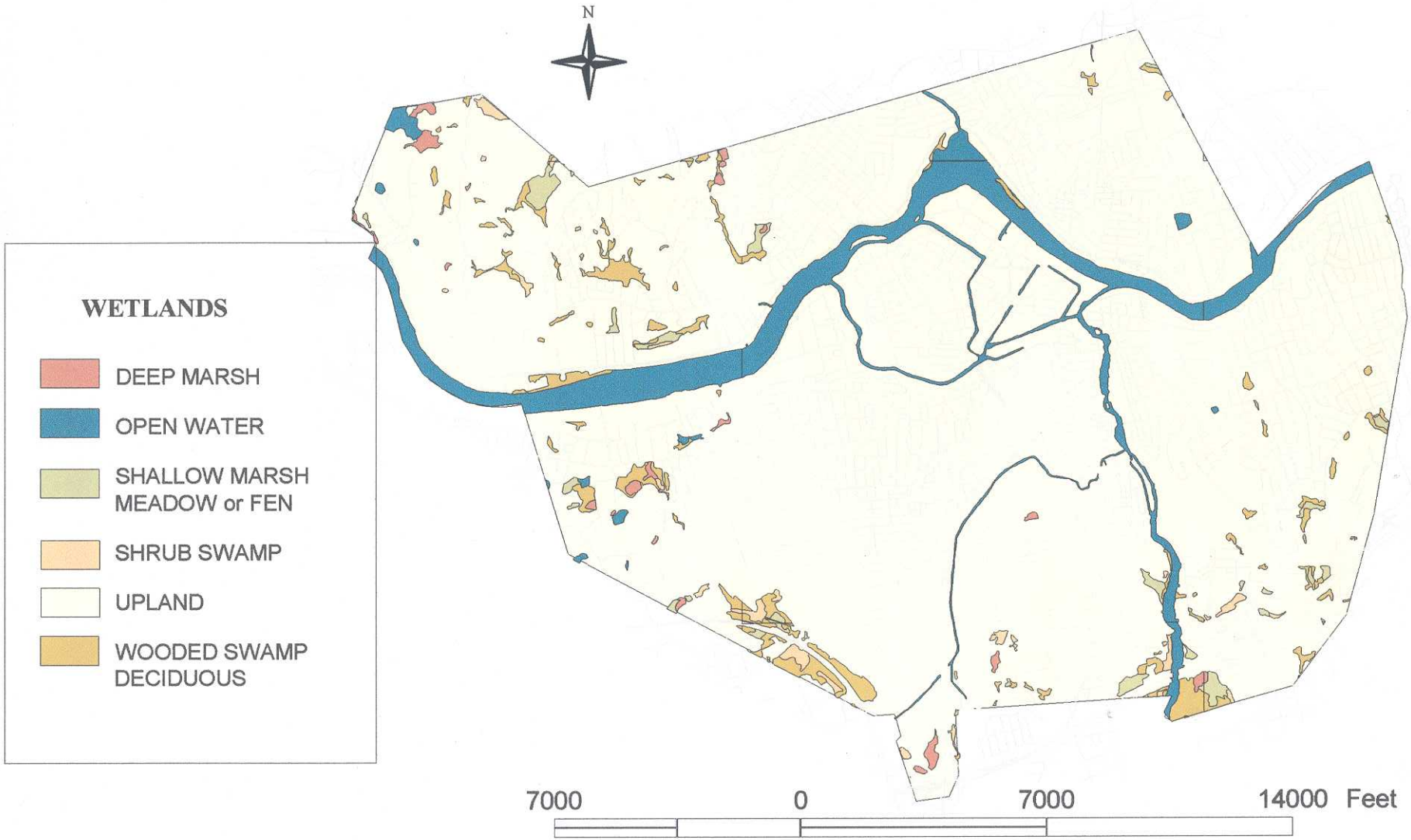
Surface water discharges to the Merrimack and its tributaries results from both public and private sources to contribute to reducing water quality. According to DEP, there are nine municipal National Pollution Discharge Elimination System (NPDES) outfalls to surface water in the city. Lowell, as with most older cities, has a combined sewer and storm water system. The Lowell wastewater Treatment Plant (LWWTP) is a secondary facility, which receives wastewater from Lowell, Chelmsford, Dracut, and Tewksbury. The nine-combined sewer overflow (CSO) structures that regulate flows to the LWWTP by discharging excess storm flows directly to the Merrimack River or its tributaries. As a result, the storm water runoff that combines with the raw sewerage in the drain pipes forces some of this untreated water to flow directly into the river. Seven of the overflows discharge directly into the Merrimack River, one into Beaver Brook, and one into the Concord River.

DEP also identifies eight industrial NPDES outfalls discharging into the Merrimack River or a major tributary within the city. Three of the outfalls discharge into the Merrimack River, two into the Pawtucket Canal, two into the Lower Lock Canal and one into the River Meadow Brook.

Non-point source pollution to surface and ground water supplies are caused by land use activities. Major categories of non-point source pollution affecting the waters of Lowell include urban runoff (storm drains, combined sewers and surface runoff) and land disposal (sludge, wastewater, landfills and hazardous waste sites). While it is hard to pinpoint actual locations that contribute to surface water pollution, it is possible to identify general locations throughout Lowell where such sources of pollution could be generated.

Structural controls exist to control urban runoff to water bodies. Non structural controls rely on actions to control sources of pollution. These include employing conservation techniques, establishing buffer zones from streams, requiring development standards to control erosion and sedimentation during construction, encouraging community activities such as recycling, waste oil collection and redesigning road salting programs. Many of these practices are being implemented in Lowell. The protection of the Concord River with a greenway park will help to reduce pollution impacts by limiting encroaching development.

One source of non-point source pollution is the extensive canal system in Lowell and the multitude of surface parking lots. Many storm drains empty into the canals transporting water to the Merrimack River. In addition, many surface parking lots and other impervious surfaces abut the canal resulting in easy collection sites for storm water runoff. Land use controls along the canals, preservation of the canal system, and greenways along the canals can help to filter out harmful pollutants and protect the water that flows through the canals. Such a program is currently underway by the Lowell Historic and Preservation Commission that aim at preserving and developing an extensive pedestrian walkway system along the canals. This plan will serve many benefits; it will protect the canals from harmful land uses, provide interpretive educational resources for park visitors and preserve an integral part of Lowell's industrial past.



WETLANDS

Lowell COMPREHENSIVE PLAN

January 2002 Existing Conditions

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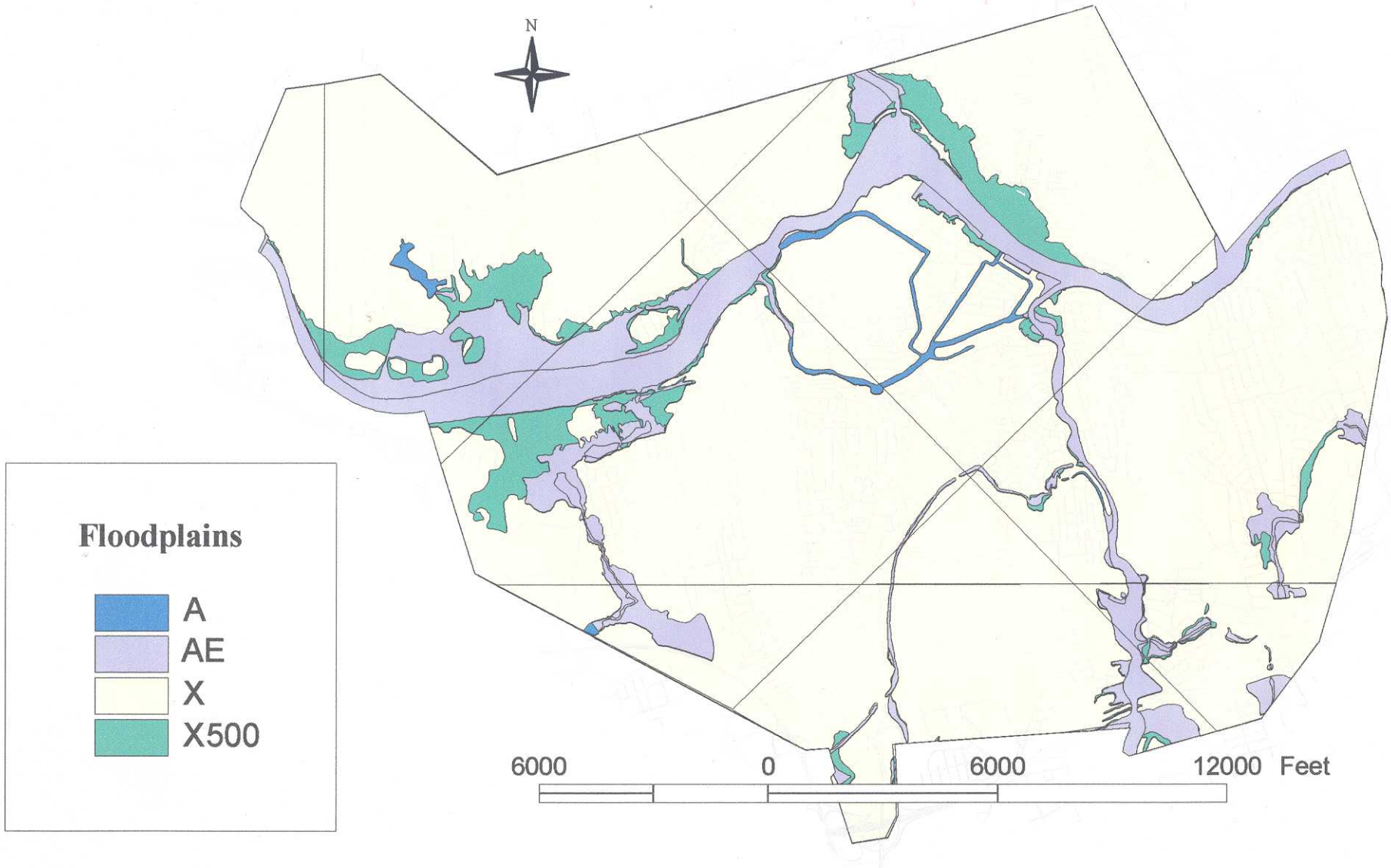
DPD

Division of Planning and Development



Floodplains

Lowell COMPREHENSIVE PLAN

January 2002 Existing Conditions

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